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A
LECTURE
ON
THE BEST MODE OF UTILISING SEWAGE
OF TOWNS,

DELIVERED BEFORE
THE DORCHESTER FARMERS' CLUB,

BY THE
REV. H. MOULE,
(VICAR OF FORDINGTON,)

ON SATURDAY, NOVEMBER 12, 1864.

REVISED AND ENLARGED FROM A PAPER READ AT THE
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LECTURE

ON

THE BEST MODE OF UTILISING SEWAGE OF TOWNS.

THERE was a very large attendance at the monthly meeting of the Dorchester Farmers' Club, in the large room at the Antelope Hotel, on Saturday, the 12th of November, 1864, it having been announced that the Rev. H. Moule, vicar of Fordington, would give a lecture "On the best Mode of Utilising Town Sewage." The chair was occupied by Mr. G. J. Wood, the president, and Mr. Genge officiated as deputy vice-chairman, in the place of Mr. James Harding. After transacting some minor business, the meeting proceeded to the more immediate and important matter before them.

The Rev. H. Moule, who was received with applause, said : Gentlemen,—Although you have requested me to read this paper on the best mode of utilising the sewage of towns, there are those who doubtless will inquire, "What has a clergyman to do with such a question ?" And my reply to such an inquiry is simply this, that from the directions contained in Holy Scripture and from the example of the blessed Saviour himself, I learn that the great and supreme object of a clergyman's life

must be the promotion of his Master's glory in the salvation of souls. But from the same sources I also learn, that he, certainly no less than others, must seek to do good to the bodies of men, to promote their temporal welfare, and perhaps especially to seek to feed the hungry and to clothe the naked. Now in the discovery, to which I have been led, of the marvellous capability of dry earth and of various subsoils for the absorption and deodorisation of excrementitious and other offensive matters, and of their consequent applicability to the removal of such matters from our premises, our houses, and even from crowded towns, a means of doing an incalculable amount of good has been placed within my reach. And nothing but a deep sense of the obligation to seek to do that good has prompted and sustained me during six or seven years against the contempt, and ridicule, and reproach, and the strong dissuasion of many in my efforts first to publish the principles of my proposed system, and then, when no one else would do it, to work out, with the help, however, of Mr. James White, of this town, what I think I may now call the perfect application of those principles.

The benefits to be derived from the dry-earth system, are varied in their kind. They are sanatory, social, moral, and economical. The subject, however, which you have assigned me, will limit my observations this evening exclusively to the latter class of benefits. Notwithstanding this, I still feel that I am within that sphere of duty of which I have before spoken; for while seeking, and with great pleasure to myself, to promote the true interests of agriculturists, yet at the same time, in placing before you a means of rendering



food and clothing cheaper and more abundant, I am helping to feed the hungry, and to clothe the naked. In further justification of this you must allow me to make another reference to Scripture ; and I do it the more readily, because the passage I shall quote contains within it the basis of all true political economy, and places agriculture in its proper position. “ Moreover the profit of the earth is for all ; the King himself is served by the field.”—Ecclesiastes v. 9.

But now to my subject, on which, for the sake of simplification, and of rendering my remarks more practical, I must place a further limitation ; for unless I do this at the outset, it will be almost impossible that you should divest your minds of the difficulty, which I believe to be insurmountable, of disposing of the immense proportion of water now necessary in the ordinary mode of removing the sewage of towns. On the utilisation of sewage in a liquid form, such for instance as that which the Metropolis pours forth at the rate of from 90,000,000 to 100,000,000 of gallons daily, I have nothing to say ; nor do I believe that any one has anything to say that, in the true sense of utilisation, is either practical or practicable. I propose rather to consider the best mode of utilising the excrementitious matter, and the animal and vegetable refuse of houses and towns. For, under the sanatory point of view, these are the great and general source of evil ; and if we can dispose of them we shall find it easy to deal with the minor and more special difficulties of factories, &c. Whereas, under the economical point of view, in these substances of which I speak lies so much the larger proportion of the value of the sewage of towns, that if I can show how these can be

secured, instead of being wholly or partially wasted, I shall show to a certainty the best mode of utilising that sewage. All other substances, however, of any value, may be secured too. But this may well be a matter of subsequent consideration, and in the event of the application of my system to any town or village, it may be a matter of easy subsequent arrangement.

By the adoption of the dry-earth system, then, I assert, and will show you, that the excrementitious matter of our population, whether in town or country, together with all the animal and vegetable refuse of our houses, may be utilised. And by this I beg to be understood to mean, that it may be turned to advantage, or be made a source of profit, and that a profit not merely partial and local—not just to the company that, at a nominal price, may rent the sewage, nor to the town that supplies it—but an advantage and a source of profit at least to the country around. In order, however, to institute a comparison between this and any other system, it will be necessary first to be satisfied as to some well-grounded estimate of the value of the substances of which I am speaking, when secured and removed in a state undiluted and unencumbered by water, and then to agree on certain requisites in the mode of saving, removing, and disposing of them, the existence or the absence of which will render that mode of removal as a mode of utilising either good or bad.

Now, as to an estimate of the value of these substances, I have met with none more reasonable in itself, nor resting on more simple and common-sense data, than that given me by one of your own society, Mr. R. Damen, and which, with his permission, I have inserted

in the second and third editions of my pamphlet, "National Health and Wealth." That estimate is £1 a-head, annually, for the members of a family or the population of a town ; and he arrives at it in the following way :—He says, that any intelligent farmer, who understands his business, will admit that one-third of the value of the corn given to his cattle goes on to his ground in the form of manure. And, applying this to the food and excrement of human beings (and I suppose he would include the kitchen waste), he reasons thus :—Take the average value of the meat and corn food of each individual at 2s. a-head per week, or at £5 a year ; then, instead of one-third, take only one-fifth of this as the average value of the manure made by each person, and you have as that average value, £1 per annum. So that, for this town of Dorchester, the gross produce would stand for the whole population at £7,000 ; and for Carlisle, a city of 30,000 inhabitants, of which I shall presently have to speak, it would stand at £30,000 ; while the manure that might be saved from the whole population of Great Britain and Ireland, would, if rightly saved, be worth £30,000,000 sterling a year. Many I know will think this estimate extravagant. If, however, the manure be saved without water, I am sure that it is not extravagant. But suppose, for one moment, that this value were reduced to one-half, or even one-third, and you estimate it for the whole country at £15,000,000, or at £10,000,000, or for Carlisle at £15,000, or £10,000, or for Dorchester at £3,500, or £2,300, is not the question of the right mode of saving and utilising these substances a question relating not merely to the various towns and their immediate vicin-

ities, but to the great agricultural interest as well, and to the whole country as affected by that interest ?

And yet, after a good deal of study of Parliamentary inquiry and evidence, I am bold to assert that hitherto there has been absolutely no reasonable attempt thus to deal with this question. Every mode of utilising the sewage of towns that I have seen has been either far too partial, far too limited, or far too expensive ; and the highest idea which those recommending these modes seem to entertain of the word “utilise,” is the prevention of absolute and entire waste. Encumbered by the water medium of removal, and thus compelled to apply the manure in a liquid form, the sphere of operation is necessarily confined to the vicinity of towns. And, if dependent on the natural flow of the sewage water, the area to be fertilised must either, by the nature of the ground or by the season for applying the manure, generally be very limited ; while the owners of that ground will be very unlikely to give anything like the real value of that with which their neighbours in the town must of necessity part. But if, as some have proposed with respect to the sewage of London, recourse must be had to pumping this liquid sewage to a great height, in order to send it to the higher ground of Bagshot Heath, then the enormous expense of the water drainage system will be vastly increased, and that at the risk of a similar difficulty as to the demand. For either as to extent or as to price, this demand will, under such circumstances, almost of necessity fall far short of rendering a profitable return to these who furnish the supply. And this matter of expense, and even of incurring by such new works the risk of throwing additional burdens

on the tradesmen and labouring classes of our towns, ought to receive from our legislature, our boards of health, our sanatory reformers, and our engineers, far greater consideration than, in my humble opinion, it has hitherto received. *It is no light matter to take half a year's rental, or one or two years' rental, of a town, for public works, and thus add £1 a year to the rent of the poorest cottages,* and then, perhaps, in order to correct the mistake into which for some few years men had been running headlong —that of polluting rivers and streams—to add something more in order to carry out some costly plan for utilising, as they call it, this liquid sewage.

Let me state, then, as the first requisite of a good mode of using that which is at the same time the most offensive and the most valuable portion of the refuse of our towns, that while improving the sanatory condition and the comfort of the town, it should make that refuse a source of profit, or at all events prevent its removal from being a matter of burdensome expense. Then, and in order to this, the manure, so saved and removed, must be of such power or virtue, and in such a form, and obtainable at a price so moderate, that it shall be able, by setting the inferior price against the perhaps inferior power, to compete with foreign and artificial manures, and so command a ready sale. And again, it is requisite that it shall be as easy of transmission to the most distant parts of the country, and as easily applicable to the land as any of those manures. If these requisites can be provided, there will be no need of my saying that *hill farms and down farms and farms, that from a distance send their corn and meat to the towns, have as great a claim on that manure as the valley below*

any particular town or the heath in its immediate vicinity. Those farms in that case will take it, and the towns on their part will be ready enough to supply it. All this then I will now proceed to show you can, by the dry earth system, be easily effected, and that in a way the most conducive to health, and decency, and comfort, and by a process of removal far less expensive than any that has hitherto been devised. It will serve to strengthen my statements of the necessity and the value of the several requisites above mentioned, if, before I describe the dry-earth system, I give you by way of contrast two or three instances of what is considered a good mode of utilising the sewage of towns.

One person, who represents, I think, a company formed for utilising the sewage of the metropolis, states in his evidence before the committee of the House of Commons, that he would distribute that sewage over 30,000 acres. Another gentleman, and he quite an authority in such matters, says he should prefer 50,000 or 60,000 acres. Now take the lower estimates of the excrementitious matter and of other animal and vegetable substances together, namely, 10s. or 6s. 8d. a head, and add to this value the cost of public and of private works, and turning away your attention for one moment from the pollution of the Thames, say is not this pouring of that, on so limited an area, which cannot be worth much less than £1,000,000 sterling per annum, or say if you please £500,000, and removed at the cost of many millions, is not this to waste, or at least to squander rather than to utilise?

Next take the far-famed meadows near Edinburgh, which are irrigated by the sewage of that city. It is

perfectly true that the produce of those meadows is almost fabulous. The sum of £40, and even £50, has been received as the rent of an acre ; and every acre will carry 10 cows. But what is the amount and value of the manure given to this land ? The sewage of 300,000 people, worth at the lowest estimate, if properly saved, £100,000, is poured over some 260 or 300 acres !

Then take Carlisle, which was placed in the schedule of the same Act of Parliament that placed this town of Dorchester under the Board of Health. If the cost of the works in that city bears the same proportion to the cost of ours as that population bears to this, then they must have spent on them from £60,000 to £80,000. At first they polluted their river, as we pollute ours—they thus throwing away £30,000, or if you please £10,000, and we £7,000 or £2,300. But they have recently made such a step in advance in the way of utilising their sewage, that the chairman of the Metropolitan Board of Works and his secretary thought it worth their while, about a fortnight since, to go and inspect the mode of utilisation adopted there, and the tone of the paragraph in the *Times* newspaper describing this visit, implies, I think, something like satisfaction. But what is it ? The sewage of 7,000 of the population is avowedly thrown away. That of 23,000 deodorised by Mr. McDougal's admirable disinfecting powder is poured over 60 acres. £23,000 worth of manure, or if you choose £8,000 worth, raised at such a cost, spent on 60 acres !! Is not this again to waste or to squander rather than to utilise ?

Now then for the contrast. Water, as you see, does

not deodorise. It rather increases within a few hours the offensiveness of the smell, and itself needs to be deodorised. Whereas a pint and a half or 2 lbs. of dry earth or clay, if the evil be taken at once and in detail, deodorises immediately, and at the same time preserves the value of the urine and of the solid fæces ; while instead of diluting, as water does, it may for certain soils add to the value of the manure, as, for instance, when various clays and silicates shall be used and afterwards applied in this mixed state to our heaths and light lands.

Next, for the application of this system, no public works are required. For if by means of it you get rid of the excrementitious matter and of the kitchen refuse, you may then, without offence or injury, allow the water, used in washing, to descend into a cesspool. Then, the cost of the private works would not be above one-third of that incurred in the water-drainage system. Whilst the expense of maintaining the one in comparison with that of mending pipes and cisterns and repairing closets in the other would be as nothing. Indeed, as I will presently show you, both the first cost of these works and the cost of keeping them in repair and of the supply of earth and of the removal of the soil, might be no more than a percentage on the original outlay in the form of rent.

Again, it will, perhaps, astonish some persons when I assert that the supply of earth or clay for many towns, such, for instance, as this town of Dorchester, would be easier and less expensive than the supply of water. The facility of this supply of earth to towns is the greater from that property of dry earth or subsoil, to which I

wish to call special attention, namely, its capability of repeated action in the absorption and deodorisation of offensive substances. For if after use and removal it be intimately mixed with the offensive matter, it is easily and inoffensively dried ; and when dried it absorbs and deodorises the tenth time as readily and effectively as at the first. In the country and in situations in which the manure can at once be deposited in the earth, this repeated use is unnecessary. But in the case of towns, in which a manure company would be formed for the purpose of the supply of earth and of its removal after use, and of its sale when manufactured into a saleable manure, it will be of the utmost importance to condense this manure as much as possible, with a view to rendering it easy of carriage and of application to the ground, either in the use of the drill or by sowing it. Before stating the probable quantity of earth required in any particular town, I would have you notice that the value of urine as manure is about eight or ten times that of the solid faeces, and that by the adoption of urinals on this dry-earth system, both in public places, in large establishments, and at railway stations, that which is now to a great extent wasted and lost may, with vast increase of comfort and to the great promotion of decency, be almost entirely saved.

Now, first reminding you that I am perfectly unscientific, and no man of business, and admitting that the estimates and plans of one who has so little time for these matters are open to much modification, let me give you a rough estimate of the supply of earth, and of its treatment. For all the circumstances above mentioned, for public and private places, for the family

and the kitchen, for night and for day,* I would estimate the quantity of dry earth per head at 12 lbs. a day; that is, supposing it to be used only once, at two tons a year. This, for a population such as that of Weymouth, which, I think, is 14,000, would in that case be 28,000 tons for the whole town. Don't be startled, however, at these figures. I am going to reduce them. For supposing a drying shed to be erected, which in its erection and its use might be very inexpensive, and supposing the earth were used in every case five times instead of once, this would render the quantity necessary for one year, for 14,000 people, only 5,600 tons. And if that earth so prepared by admixture with the excrementitious and other matters, and (as it might be) mixed with some other valuable substance, were in a well pulverised state sold at £3 a ton, there would be a gross value attached to it of £16,800. Take, however, only two-thirds of that sum, say £12,000, and supposing you have to purchase the soil from many of the houses, and thus your expenses amount to half that sum, or £6,000, then a clear profit might be derived to the company of £6,000 a year. And if this can be done, and that in a way more conducive than any other to the health and comfort of the inhabitants, and at the same time with vast advantage to the agriculturists of the neighbourhood—if £12,000 worth of additional manure can be thus provided for their land, a manure applicable with ease to land in any position—then I think, gentlemen, this deserves to be styled a mode of utilising the

* For the removal of excrementitious matter alone from our houses, I feel satisfied, as I have told the people of Sheffield, that 4 lbs. per head would be sufficient.

sewage of such a town, and I venture to think it the best mode. Some perhaps may wonder whence the supply of earth is to be derived. Some of the Weymouth people, for instance, have asked this of me. To say nothing of other substances, there are clays around that town to supply its population for centuries. Some may be startled at the difficulty of the carriage of so much earth through the streets. Let such think of the carriage of coal and of ashes, of which I will say more presently.

But, gentlemen, I would place before you, in as few words as I can, a scheme which has been suggested to me for the application of this system to such a town as I have just now mentioned. Let a company be formed with a capital of, say £30,000. Remember, there would be no public works required, neither at the cost of the inhabitants nor of this company. All that the company would require would be, first, warehouses and drying sheds, and a staff of men and trucks and horses, with something of a mill for mixing and pulverising. Then they would have to supply, both for private houses and large establishments and other public places, closets and urinals, which would be their own (just as the gas-meter is the property of the gas company), to keep in repair; and for the use of which, together with the removal of all this offensive matter, the owner or occupier of the property would pay a per-cent-age of say 10 or 15 per cent. on the first cost. This for a cottage need not be above 5s. a year, and for some of the largest houses, in which several apparatuses would be required, £5 or £6. My belief is, that the whole cost of these private works would not exceed, for such a population, £12,000

or £15,000. But then I would propose that the shares should be so many and at so low a figure, that the owner or occupier even of a £5 cottage might take one, and that the shares should at first be taken in a number proportioned to the first outlay on the respective houses or properties. Now supposing the company should, on its capital of £30,000, make, beyond the rental of 10 per cent. on £15,000, a profit of £6,000, that rental would be repaid to the inhabitants at least twice over. Instead of the removal, then, of offensive matters being to them a heavy burden, it would be a source of profit. This then, again I say, is to utilise ; this I venture to think is the “best mode of utilising the sewage of towns.”

But will the dry-earth system of which I have spoken do all this that I say ? To reply satisfactorily to this question, I shall, at the risk of some repetition, 1st, recur to first principles ; 2ndly, speak of the mode of the application of those principles ; and 3rdly, show the applicability of the system to towns.

1st. As to principles. These are, first, the marvellous capability of dry and sifted earth, or of clayey subsoil, for *deodorisation*. This is such that 2 lbs. weight of earth, or $1\frac{1}{2}$ pint, is amply sufficient for one use ; so much so, that though this in practice is now discovered to be quite unnecessary, yet if the mass should be at once intimately mixed, all offensive smell and all offensive appearance are immediately removed. And not only this, but if that so mixed should be dried, its deodorising powers continue the same as the earth possessed before the admixture, and would continue, I believe, to the twentieth time. I have myself tried it so many as *ten times*.

2ndly. The second principle is the *immediate application of this deodorising power to the matter to be deodorised*—the taking the evil in detail. I would not drive the stench, by means of water, out of the house into the cesspool or sewer, there to ferment and become more and more noxious, and in that state to be driven back again, it may be, through a trapped closet into the house, or through gulley-holes and ventilators to contaminate the atmosphere in the open streets. I would *cut the evil off at its source*.

3rdly. The third principle, which has very recently been observed, and which so increases, as I will presently show you, the feasibility of the introduction of this system into large towns, is this, that if the evil be so taken in detail, and the earth be regularly applied, then there is no need of that which, for some time, I had thought necessary, namely, a process of mixing, and of a machine for that purpose. For if the deposits fall into a vault 3 feet or 4 feet deep, then the superincumbent weight of the repeated additions of 2 lbs. weight of earth, and an occasional act of levelling with a common road scraper, are sufficient for mixing; so that within six weeks from the deposits falling, the excreta and any vegetable matter, like paper, disappear, and the mass looks and smells like fresh earth. And in that vault, *without the emission of any offensive smell*, it may continue three, four, or five months.

Before I pass from this mention of principles, let me observe that this deodorising power of earth is not possessed either by sand or by coal ashes. The latter may, as an absorbent, be mixed in certain proportions with earth or clay, and so, together with street sweepings,

help greatly towards supplying the means of cleansing a town. But they are not and cannot be made a substitute for earth.

II. But next, let me speak of the application of these principles. For commodes in sick rooms and wards of hospitals, and for some closets, a galvanised pail must be used as a receptacle, and placed in a case. For closets generally, whether up-stairs or down-stairs, whether in the house or out of the house, there should be a vault prepared some 4 feet square or less, according to circumstances, and 2 feet, 3 feet, or 4 feet deep, with an opening for the levelling, of which I have before spoken, and for the removal of the substance when required. This opening may be either behind, or in the front, or in the floor, as most convenient.

In many a cottage and in some schools, and, as I conclude, *in the now general adoption of my system throughout British India*, a box of earth is placed in the closet, furnished with a scoop holding $1\frac{1}{2}$ pint of earth, and the process is by hand. But as this process cannot always be reckoned on, a simple piece of machinery has been devised for the purpose. A description of this, with drawings, will be found in the prospectus of White & Co., 29, Bedford Street, Covent Garden, London. I will only add to that description that, in the case of commodes, through the efficiency of this machinery there will arise one of the greatest reliefs to suffering humanity. For thus, and especially through the use of commodes in which a lifting handle is used, all offensive smell, and all noxious gases, may *for ever be banished from sick rooms*. And who is there who does not know the necessity of some such relief as this in our large

schools, our hospital wards, our asylums, and gaols and union houses ?

I must also add, that by the use of a 10 or 12 inch pipe attached to the seat, these closets can be used upstairs without the necessity of carrying up any earth. The reservoir of earth, with the hopper attached, can be placed just above the level of the ground-floor, and worked as easily by a descending wire or rod from above, as if attached to the seats.

III. But now, in the last place, as to the general applicability of this system. It may be all very well in those special cases of sick rooms, &c., and even, some will say, you may get it into public institutions, or into detached houses, or even into villages ; but you cannot be so wild as to suppose that into a large town it could be introduced. (One gentleman stated at Sheffield that a person must be mad to propose to introduce it into that town of 200,000 inhabitants.) But truly I am so wedded to the system that for eight years I have been working out, that I am wild enough to be quite confident that Sheffield might easily adopt it. And I am strongly inclined to think, that if the men of business in Sheffield will fairly and calmly strike the balance between the two systems proposed to them, they will adopt it. On the one side let them place the proposed expenditure, of which I have heard, of £250,000, on sewers, &c., which shall scarcely diminish, if it do not increase, the contamination of the air, and which shall either throw away the manure or expend it on a tract of land that shall pay next to nothing in comparison with the outlay, and in comparison with the real value of the manure. And on the other side place—first, that this main source of

the contamination of the air is *entirely cut off*; secondly, that *all public works are for this system unnecessary*; and thirdly, that by a company formed for the supply and removal of the earth, and so for the manufacture of manure, an income of at least £25,000 or even £50,000 a year might be made. Let the balance between these two systems, I say, be fairly struck, and I feel a strong conviction that there are men of intelligence and spirit and philanthropy who will make the attempt. One great advantage of the system is, that *you have not to commit yourselves at once and for ever to very expensive works*. You may try it partially. You may commence on public buildings. Take your Corn Exchange, for instance, your schools, and that act of public charity which I will be bold to mention—*let public conveniences be erected on this system.*

I will, in conclusion, give you a rough estimate of the quantity of earth or earthy substance formed by the clay of this town and neighbourhood, mixed with certain proportions of ashes and street sweepings; or you may take it, if you please, as composed of dry and sifted clay alone. 4 lbs. a head would be sufficient for each individual per day. Taking the population at 200,000, this would be 800,000 lbs., or about 360 tons a day, or 130,000 tons a year, *if used only once*; but if used, which it well might be, four times, and the manure be thus increased in value, and be more easy of carriage, no more than 33,000 tons would be required; and those 33,000 tons ought to be worth at least £60,000. To this might be added the refuse of slaughter-houses, the soot of chimnies, and the animal and vegetable matters of sinks. But some people say, “Only think of the labour involved in all

this." Well, suppose it be so, in this, as in all useful labour, there is profit. But what is that labour as compared with that involved in the supply of only one necessary of life, even our coal ? At the rate of 4 lbs. of earth per head per day, $\frac{1}{2}$ cwt. would be required by a single person once a fortnight ; $2\frac{1}{2}$ cwts. would be required for a family of five persons in that time, or 1 ton every sixteen weeks. Is it considered a great trouble to have 1 ton of coal delivered every sixteen weeks ? And the removal need not be more frequent than this ; and that removal, remember, would be far less offensive than the present removal of the ashes from your ash-pits. Nay, it need be no more than the removal of fresh earth. In conclusion, I would say, that I have thought it right to give the two estimates for Weymouth and Sheffield, and at the different rates of 12 lbs. a head for all purposes, and 4 lbs. a head for excrementitious matter alone.

NOTE.—It may seem strange that I should thus have given two different estimates for Weymouth and for Sheffield, and at first sight they may appear inconsistent ; but it will readily be perceived that the rate of 12 lbs. a head is for all purposes—that of 4 lbs. a head for excrementitious matter only.

THE END.







